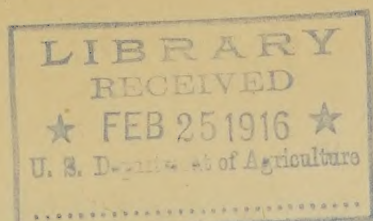


Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

1.9
Ex 619



AGRICULTURAL EDUCATION MONTHLY.

U. S. DEPARTMENT OF AGRICULTURE,
STATES RELATIONS SERVICE.

AGRICULTURAL INSTRUCTION DIVISION.

Vol. II, No. 2.

February, 1916.

PEACH GROWING AS A SUBJECT OF INSTRUCTION IN SECONDARY SCHOOLS.

RELATION OF SUBJECT TO COURSE OF STUDY.

Relation to course in horticulture.—Peach growing comes naturally as a part of a general course in horticulture or a special course in fruit growing. In sections where peaches are the chief orchard product the principles of fruit growing may be taught largely in their application to peach production. Where a number of orchard fruits are grown, and all are given a place in the course, it has been found most satisfactory to consider orchard management in a general way, making special applications as needed. The general principles and practices underlying the preparation of the soil, planting, cultivation, pruning, control of pests, picking, packing, and marketing are much the same, hence it would be a needless repetition to consider each fruit separately for all phases of culture. As much that pertains to peach production will apply to other orchard fruits the suggestions which follow may be applied in a general way to a course in fruit growing or to other special fruit crops.

Seasonal sequence.—The adaptation of this subject to the season will depend upon the climate of the region in which the subject is taught and the extent to which the subject is treated in the course given. Growing peaches involves activity for all seasons of the year, much of the work coming during the summer vacation period. Wherever convenient the topics should be considered in season. It is especially important to do so if practice is to be given in connection with classroom instruction. In most districts school will begin at the time of marketing the peach crop. Picking, packing, and marketing may be considered best at this time. Planting may be considered either in the fall or spring, according to the practice of the district. Pruning should be discussed during the dormant season for the trees when the students may make practical application of the principles. The season for spraying will vary with the pests to be controlled. It will be necessary to consider cultivation and other summer activities out of season.

Correlations.—Where science courses are given apart from the course in agriculture, this subject offers an opportunity for application of some important principles of several branches of natural science. In considering the effect of air drainage, foretelling frost, and frost protection, some of the principles of the physics of the atmosphere must be understood and applied. A consideration of insect pests involves correlation with the course in zoology. In the mixing and application of sprays and fertilizers the principles of chemistry are applied. While the whole subject as it deals with the development of the tree and the production of fruit is an application of botanical principles, a study of peach buds and fungus diseases offers special opportunities for correlation with botany as usually taught in the high school. In planning the orchard and computing the number of trees per acre with different systems of planting

there should be correlation with geometry and other courses in mathematics. Where the agricultural students have not had any of the courses in science or are not taking them at the same time they are taking the course in horticulture, it will be necessary for the teacher of agriculture to spend more time upon the scientific principles underlying the agricultural practice.

Adaptation of subject to secondary schools.—Students in secondary schools are prepared for a more thorough discussion of underlying principles than students in elementary courses. A study of the sciences upon which agriculture is based enables them to determine why certain things should be done in a certain way better than elementary students. There may be danger of a secondary teacher going too far into scientific technicalities with his students, especially if he has not been long away from the more highly specialized courses of the college. The mind of the adolescent youth is interested chiefly in practical things and judges largely according to economic values. Teachers should keep in mind the inclinations as well as the capacities of their students in treating this subject. For example, it is better to spend time in a study of methods of prevention and control of fungus diseases than to go into details in the life history of the disease-producing organism. The student must, however, have some knowledge of the nature of fungus plants in general and of certain species in particular if he is to apply methods of control in an intelligent manner. As suggested in connection with correlations, this subject affords an excellent opportunity for an application of a phase of botany. Younger students may study buds because they have a general interest in things that grow. If the interest of the adolescent is to be aroused he must see the relation of bud study to practical pruning and estimation of prospective crops. Although the subject may be approached in the secondary school with a vocational aim it should be established upon a scientific basis.

CLASSROOM INSTRUCTION.

Use of Farmers' Bulletins.—The following Farmers' Bulletins of the Department of Agriculture may form the basis for a discussion of this subject in the classroom: 631, Growing Peaches: Sites, Propagation, Planting, Tillage, and Maintenance of Soil Fertility; 632, Growing Peaches: Pruning, Renewal of Tops, Thinning, Interplanted Crops, and Special Practices; 633, Growing Peaches: Varieties and Classification. Copies of these bulletins should be secured by each student. Other bulletins and books should be available for reference purposes, especially for the use of the teacher, whose knowledge of the subject should extend beyond that of his students. If a logical rather than a seasonal sequence is followed the topics may be discussed in the order in which they appear in the bulletins. The following suggestions are given as to the treatment of the topics with suggestive questions:

Historical notes.—The topics under this heading in Farmers' Bulletin 631 should be supplemented, if possible, with a report by one of the students upon the introduction of the peach into the section or district where the school is located. If it is considered worth while, and both time and publications are available, the references cited upon the first two pages of the bulletin may be assigned to individual students as topics for special reports.

Distribution and statistics of peach growing.—A discussion of this topic with a careful consideration of the table given in the bulletin will afford an excellent opportunity to review some features of national geography or to correlate the subject with commercial geography if that subject is being taught. Why do Georgia, Texas, and California lead in peach production? Why are scarcely any peaches produced in Minnesota, Montana, and the Dakotas? How does our own State and county stand among peach-producing sections? U.S. Dept. Agr. Bul. 298 (1915), Peach Supply and Distribution in 1914, may be used to supplement the Farmers' Bulletin in considering this topic. The latest United States Census Report will prove helpful in determining the supply and distribution of farm products. Each school should have the volumes of this report which deal with agriculture and the volumes containing an abstract of the whole report

with a supplement for the State in which the school is located. These publications may often be obtained free of charge through Members of Congress, or from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a comparatively low price.

Location and site.—Distinguish between the terms location, site, and exposure. What factors must be considered besides natural advantages in choosing a location for peach growing? Why should a great deal of discrimination be used in selecting a site? What are the advantages and disadvantages of the district represented by the school as a location for growing peaches? What types of soil are considered best for peaches? Why are sandy and gravelly soils often more suitable than heavier types? How does the peach compare with other orchard fruits in respect to drainage? Why may light soils be unsuitable? Why are soils excessively rich in organic matter not desirable? What is an alkali soil? Where are such soils likely to exist?

In considering temperature as a limiting factor in connection with sites with reference to elevation and bodies of water, there will be need for a practical application of some interesting and important principles relating to the physics of the atmosphere. In showing the cause and effect of both water drainage and air drainage, drawings of cross sections of hill lands made upon the blackboard are helpful. It will be interesting to the students and impress the essentials of air drainage if they use thermometers in making tests of temperatures at different elevations on still nights. Pocket-like hollows with no outlet for air drainage should be compared with surrounding elevations. Why are elevated sites usually more desirable for peaches? What may the effect of severe winds be upon orchards on elevated areas?

Will a small pond in the vicinity of an orchard affect the temperature? Why do larger bodies of water prevent injury from frosts? To what distance do these bodies of water have an effect? What part do the prevailing winds play in the influence of lakes? Give examples of districts influenced by bodies of water. In mountain sections some time should be given to the effect of mountains in radiating heat and to the influence of canyon breezes.

Why is a slope preferred to level land? What are the objections to a steep slope? Why have northern slopes been preferred by many growers? Why is there not so much difference in the temperature of different exposures above the ground? What would happen if the tree top were inclosed in a warm room while the roots were still in frozen ground? What advantage may be given the peach grower on a southern slope? Branches may be brought into the school-room some time before blooming to show the effects of the warmer atmosphere.

Temperature a limiting factor.—Students should understand the principles of frost formation and distinguish between frost and the light freezes spoken of as "frosts" in connection with fruit growing. The effect of different temperatures on the wood and buds of peach trees offers an opportunity for interesting and profitable observation and investigation by the students under the direction of the teacher. In districts where winterkilling is apt to occur students should make a record of temperatures in different localities during the coldest weather and note its effect on the wood and buds. The effect of spring frosts may likewise be noted in their effect on different stages of bud development. An accurate account of weather conditions before and after time of freezing should be made as far as possible. Such work of students in some sections has been instrumental in overthrowing some erroneous notions in regard to the effects of certain temperatures on peach buds. Why are some of the colder sections in the North more free from frost injury than southern sections? What effect has a high humidity upon the temperature? How do clouds affect the temperature in the absence of wind and in the presence of wind?

In sections where orchard heating is a promising method of protection from spring frosts this subject should be given more attention, although it will be better to consider it as a phase of orchard management. The teacher is referred to U. S. Dept. Agr. Farmers' Buls. 104, Notes on Frost (1899), and 401, The Protection of Orchards in the Pacific Northwest from Spring Frosts by Means of Fires and Smudges (1910). The students should become acquainted with

the work of the Weather Bureau of this department in aiding farmers in localities where there is danger of frost. The foretelling of frost by means of the wet and dry bulb thermometers may be profitably considered in connection with orchard heating as it involves the same physical principles as those discussed in connection with frost formation and the effect of humidity upon temperature.

Propagation of peach trees.—In most courses in fruit growing outlined for secondary schools emphasis is placed upon budding and grafting as a part of the practical work. Relatively few farmers propagate their own trees. This work is usually done by nurserymen as a special business. All students who study fruit growing should know how the nursery stock is produced and those students who wish to work into the nursery business should be given opportunity for practice under supervision. In connection with a study of this subject the class should visit a nursery where peach trees are propagated if one is conveniently located. If not the teacher may give a demonstration of budding and grafting and let each student try his hand at it. Those students who wish more training along this line may be assigned a special home project in the production of nursery stock. The class as a whole should not only know how peaches are budded but they should understand the principles underlying the budding as well. They should be able to answer such questions as the following: Why are seedling peach trees not planted in the orchard? What do the buds represent? How may each individual budded tree be regarded with reference to the original tree of any variety? How may new varieties originate? By what means other than budding may a variety be propagated? May any other kind of fruit be budded successfully upon a peach tree? May any other kind of tree be used as a stock for peaches? What are the essential principles underlying budding and grafting? What has happened when the bud takes? What influence may the kind of stock have upon the tree and fruit? What is the difference between a "June bud" and an ordinary budded tree?

Trees for planting.—Does a change of environment change the inherent qualities of a tree? What are the arguments in favor of home-grown nursery stock? What inducements may justify a purchase of stock from a distance? What are the essential points to be considered in the purchase of nursery stock? How are the trees graded? Why should a few cents' additional cost be disregarded in securing better trees? What insects or diseases may be introduced on trees? What provisions are made in the State or district for the inspection and fumigation of nursery stock? Can you recognize common forms of insects and disease which may be introduced? What are the main factors to consider with reference to time of planting? When is the best time to plant peach trees in your district? Why should trees be purchased and arrangements made for their delivery in advance of planting time? Why is it important to unpack trees and heel them in immediately after they are received? Describe the process of heeling in. Wherever possible practice should be given in heeling in and puddling in connection with planting.

Preparation of the land.—In regions where the clearing of timber land is an important problem in agriculture the subject may be taken up as a general phase of agriculture or it may be considered with special reference to the preparation of land for a particular crop. If the clearing of land is to be considered in connection with the preparation of land for growing peaches, the following publications should be used in developing the topic: Cost and Methods of Clearing Land in the Lake States, U. S. Dept. Agr. Bul. 91 (1914); An Outfit for Boring Taprooted Stumps for Blasting, Farmers' Bul. 600 (1914). In all regions emphasis should be placed upon thorough preparation of the soil. Why should deep plowing be practiced? Why is it essential to have the soil thoroughly pulverized? What crops are best for putting the soil into good condition for peaches? In regions where irrigation is practiced emphasis should be

placed on having the land properly leveled and in good condition otherwise for the application of water to the trees.

Planting the trees.—What factors will influence the distance apart at which trees are to be planted? What are the objections to close planting? What are the advantages and disadvantages of systems other than square? The blackboard should be used in illustrating systems of planting. While the laying out of the land and the planting of the trees may be taught best as practicums, the principles underlying the planting may be profitably considered in the classroom. If it is not possible to give the students practice in tree planting more attention must be given in the classroom to the details of planting. There are few schools teaching the subject in which it will not be possible for the teacher to give a demonstration of proper planting along with methods of preparing the tree for planting.

Tillage.—If this subject has been discussed previously in a general way, an opportunity will now be afforded for a review of the general principles underlying the practice in its application to peach production. In arid and semiarid regions where water is the chief limiting factor in growing peaches, too much emphasis can not be placed upon thorough cultivation as a means of conserving moisture. If the students understand the principles underlying the practice they will be in a position to determine in a better way the methods to be used under local conditions. In connection with this study the students should observe methods used by different growers and the effect upon the trees and the crop of peaches. A visit to an implement dealer to study different kinds of cultivators will be profitable at this time, especially if connected with observation of the use of the implements in the orchard.

Maintaining the fertility of the soil.—This topic also affords an opportunity for the application of general principles which may have been considered previously. What problems are presented in maintaining the fertility of an orchard not met with in the culture of field crops? What is one of the chief objections to any section of country specializing too exclusively in orchard fruits? In some sections emphasis should be placed upon a combination of some form of animal husbandry with fruit growing as a means of maintaining fertility. A review of the principles underlying the use of cover crops should be followed by a consideration of those crops which give promise of greatest success in the district. The problems of managing the same kind of crop will also vary with local and seasonal conditions, hence the need for adaptation of this topic. In many sections of the East and South cover crops must be considered chiefly in relation to the maintenance of fertility and preventing the washing and leaching of soils, while in the arid West emphasis should be given the maintenance of the organic matter in the soil in connection with a limited supply of moisture. The statements regarding the application of cover crops to local conditions apply also to commercial fertilizers. It may be possible for the school to conduct a fertilizer test as suggested in Farmers' Bulletin 631 upon a neighboring orchard as a class project. Such a project would give practice to the students in the home mixing and application of fertilizers and at the same time serve as a demonstration to the community.

Irrigation.—The production of high-grade peaches in arid regions calls for an intelligent use of irrigation water, hence the irrigation of peaches should be emphasized in such sections. As irrigation will influence the preparation of the land, planting the trees, and cultivation, Farmers' Bulletin 404, *Irrigation of Orchards*, should be used throughout the course in adapting the other bulletins to irrigated sections.

Pruning.—There is probably no farm operation which exemplifies in a better way the difference between the science of agriculture and the art of farming than the pruning of fruit trees. Pruning is essentially an art in which skill is attained by practice; it is based upon principles, however, which are learned by careful observation and study. A knowledge of the

underlying principles is essential to an intelligent and efficient application of the art. The consideration of this topic will depend to a great extent upon the previous work of the students. To understand the principles upon which pruning is based the students must know in a general way how plants grow. They should understand the work of roots and their relation to the branches and leaves. They should know how plant food is prepared in the leaves and how it is transported to different parts of the tree and at what time and under what conditions it is stored for future use. An understanding of the function of wood tissues is essential, especially in connection with the healing of wounds and grafting. If these principles of plant physiology have been studied previously they may be reviewed in their application to the pruning of peaches. This knowledge will furnish a basis for a discussion of the objects of pruning as outlined in Bulletin 632. Special attention should be given the fruiting habits of the peach. Branches from young trees and bearing trees should be brought into the classroom if it is not convenient to study buds in the orchard. Most of the instructions in the bulletin pertaining to this topic are upon the practice of pruning, hence they should be considered in connection with the practicums as outlined later. Much time is often lost in considering practical details in the classroom which may be taught more effectively in connection with practice. The following questions will suggest topics for a discussion of principles which underlie practice: To what extent must the habits of growth be considered in pruning a tree? Why should the growth of young trees be directed rather than corrected by pruning? What is the effect of winter pruning in comparison with summer pruning? What influence does the climate have upon the time of pruning? How may the fertility of the soil and the amount of water affect the pruning? How does the principle upon which bearing trees are pruned differ from that underlying the pruning of young trees? What are the principles underlying the renewal of tops by pruning?

Changing the top by budding and grafting.—If the principles underlying budding and grafting have been discussed in connection with propagation, at this time special methods of top-working should be discussed. If there is particular need for working over varieties in the district emphasis may be placed upon this topic in the classroom and as a practicum.

Thinning the fruit.—It is often possible with an energetic class of students for an able teacher to launch a campaign for better methods through his classroom instruction. In sections where thinning and other such profitable operations are not practiced the students should be prepared for propaganda work at home and among neighbors. The following questions may aid in their preparation to argue for thinning. What arguments are made against the thinning of peaches? What are nature's ideals in fruit production, and how do they compare with the ideals of man? How may thinning be regarded with respect to pruning? To what extent may thinning be accomplished in the pruning? What factors influence the number of fruits of good size a tree may produce? Is the problem of thinning the same for all varieties? Why is the cost of thinning not prohibitive? When is the best time to prune? What is the cause of the so-called June drop? Why is the development of the pits a comparatively exhaustive process? In irrigated sections the effect of irrigation on the development of fruit and the natural thinning of the peaches should be discussed at this time.

Control of insect pests and fungus diseases.—In secondary schools economic entomology and plant pathology are not usually taught as separate courses. The nature of plant and animal parasites is usually considered in a general course in biology or in separate courses in botany and zoology where such courses are given. The control of pests may be treated in a better way in connection with crop production. If courses in biology are not given it will be necessary to spend more time upon the general nature and classification of the pests in the agricultural courses as a basis for methods of control. The attention of the class should be centered upon pests which are prevalent in the district or which may be introduced.

The following publications will be found helpful in considering methods of control of the most common enemies of the peach: *Principal Insect Enemies of the Peach*, Yearbook U. S. Dept. Agr. 1905, pp. 325-348; *Spraying Peaches for the Control of Brown Rot, Scab, and Curculio*, Farmers' Bul. 440 (1911); *California Peach Borer*, Bur. Ent. Bul. 97, pt. 4 (1911); *Peach and Plum Slug*, Bur. Ent. Bul. 97, pt. 5 (1911); *Lesser Peach Borer*, Bur. Ent. Bul. 68, pt. 4 (1907); *Peach Tree Borer*, Bur. Ent. Circ. 54 (1903).

Interplanted crops.—This subject should be treated at this time from the standpoint of the effect upon the trees and the production of peaches. Methods of care and cultivation of the various crops should be discussed only as they influence the peach crop, otherwise the class will find itself considering general agriculture instead of fruit growing. The interplanting of peaches with other fruit trees may be considered in connection with planning and planting the orchard.

Some special practices and some important correlations.—Success in teaching a subject along with success in farming practice depend to a great extent upon the local application of general principles and practices. The teacher should consider carefully the suggestions given under these headings and utilize them if they apply to the section where he is teaching. He should utilize publications of the State experiment stations, especially those of his own State, in securing suggestions for the most modern methods and especially in meeting problems of a local nature. It is better to apply the topics to local conditions as they are taken up rather than to treat them in a general way and then make application to local conditions.

Varieties and classifications.—The attention given these topics will depend upon the extent of the course and upon local conditions. An extensive treatment of varieties and classification of fruits is considered more reasonable in a college course in pomology than in a secondary course in general horticulture. As suggested in Farmers' Bulletin 633, a selection of the right varieties is extremely important; yet little time need be devoted to the subject in some sections, as the varieties best suited to the district have been determined. The modern tendency is toward specialization with regard to varieties. In districts where the Elberta is grown for commercial purposes to the exclusion of almost all other varieties, little time need be given other varieties unless it be to consider those which give promise of replacing the Elberta or extending the season. In considering any variety attention should be given the habits of growth of the tree and its ability to produce as well as the nature of the fruit and its time of ripening. Where a number of types and varieties are grown more attention may be given to classification. Exhibits are very helpful to the students as an aid to learning varieties. If it is not convenient for the class to visit a fair at the time the subject is being discussed perhaps arrangements may be made for a local exhibit at the school. In giving students practice in judging fruit a score card will be helpful at first. If such cards can not be secured from the State agricultural college the students may make up a scale of points after they have studied the essential qualities of peaches for different purposes.

PRACTICUMS.

As suggested in connection with some of the topics for classroom instruction, a great deal of peach growing is art to be learned by practice. Not only is practice given in the exercises suggested as practicums but the underlying principles are learned in a much better way because they are applied. These exercises also afford experience and concrete material upon which to base abstractions in the application of an inductive method. The practical work should be made a definite part of the course and sufficient time allowed for it. The practicums suggested may be carried out best as class practicums under the direction of the teacher at the school. If the school does not own land for peach growing use may be made of neighboring orchards. The school should own a spraying outfit and other tools for orchard work, but a lack of such

equipment is not sufficient excuse for neglecting the practical work as students may bring tools with them from home or equipment may be borrowed from patrons. Practical work should be announced in advance so that students may come prepared to work. While some demonstration on the part of the teacher may be necessary at first, it should be borne in mind that the students will get value out of the exercises in proportion to the actual practice they receive. Other practicums may be conducted in addition to the following:

Planting.—Each student should have the opportunity of planting at least one tree according to the directions in Farmers' Bulletin 631. If students have an opportunity to plant trees at home such work should be given credit as a home practicum if carried on according to directions.

Pruning.—The teacher should seek opportunity for as much practice as possible for the whole class to take part in pruning trees of different ages and in different states of care with respect to previous pruning. U. S. Dept. Agr. Farmers' Bul. 181, Pruning, may be used to supplement the directions given in Farmers' Bulletin 632.

Spraying.—Practice should be given in mixing sprays and their application for fungus diseases and insects according to the needs of the district. Directions for spraying will be found in the bulletins listed in connection with the topic under classroom instruction.

Budding and grafting.—Practice may be given in budding nursery stock or in either budding or grafting as methods of top-working older trees. The making of grafting wax should be considered a part of this practicum. Directions for making grafting wax as well as instruction regarding various methods of budding and grafting are given in Farmers' Bulletin 157, The Propagation of Plants.

HOME PROJECTS.

Wherever it is possible to arrange for supervision students may gain practice in much of the art of growing peaches and make application of the scientific principles underlying the art through carrying out a home project in some phase of peach production. The home project should have a definite relation to the course of instruction given at the school. To bring about this correlation the instructor should aid the student in planning his project and preparing a study outline. If the majority of the students are conducting similar projects the same outline may be followed by the teacher in class instruction. It is essential to secure the consent of parents and their cooperation in the work. The student should have a financial interest in the outcome of the project and should assume all responsibility as far as possible. A detailed record should be kept of work done and all costs and receipts. This record will form the basis of a written report to the teacher. As the production of peaches from the planting of the trees to the marketing of the fruit involves too long a period to fit in with a secondary course, the work is divided into three separate projects, although a combination may be made of these projects.

Production of nursery stock.—The student who is interested in the nursery end of the peach business should be given an opportunity to grow several hundred peach trees for planting. The practice will vary with the locality but in most sections will involve work for two seasons.

Starting a peach orchard.—Arrangements should be made to have the students undertaking this project prepare the land, buy the nursery stock, plant the trees, and care for a young peach orchard of an acre or more for one year.

Care of a bearing orchard.—This project will involve cultivation, pruning, spraying, and thinning. It may also involve picking, packing, and the marketing of the crop in connection with class instruction on that phase of the peach industry.